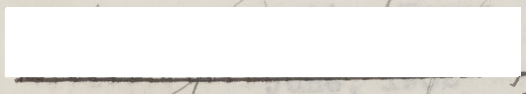
THE GEOLOGY OF AN AREA ONE MILE SOUTH OF AUSTIN

Approved:

THIS IS AN ORIGINAL MANUSCRIPT
IT MAY NOT BE COPIED WITHOUT
THE AUTHOR'S PERMISSION

Approved:



Dean of the Graduate School.

June 3, 1932.

THE GEOLOGY OF AN AREA ONE MILE SOUTH OF AUSTIN

THESIS

Presented to the Faculty of the Graduate School of
The University of Texas in Partial Fulfill-
ment of the Requirements

For the Degree of

MASTER OF ARTS

By

Claude Osborne Fletcher, B.A.
(Bandera, Texas)
Austin, Texas

June, 1932

PREFACE

The writer wishes to acknowledge that the subject of this paper was suggested by Dr. F. L. Whitney and that anything of merit accomplished in it is due entirely to his aid and instruction in the field as well as his constructive criticism of the paper.

To Mr. A. B. McCollum, the writer wishes to express his gratitude for his company and aid in the field work.

To Dr. F. W. Simonds and Mr. J. E. Pearce the writer wishes to extend his thanks for their aid in preparation of the manuscript.

TABLE OF CONTENTS

THE GEOLOGY OF AN AREA ONE MILE SOUTH OF AUSTIN

INTRODUCTION

Although much work has been done along the Balcones fault zone in Travis County, many questions arise concerning the correctness of existing geological maps due to many new facts which have been learned about several formations since the original mapping was done. In view of these new discoveries it will be necessary to remap much of the Austin quadrangle, especially that portion along the Balcones escarpment where many formations are present in a very narrow area.

This paper has as its purpose the study and mapping of the formations in the Balcones fault zone, just south of Colorado River near Austin. This area extends approximately two miles south from Colorado River, beginning at the fault between the Edwards and the Glen Rose formations just west of the Austin Dam and extending down the river to the I. & G. N. railroad track.

PHYSIOGRAPHY

This area, which is in the Balcones fault zone, lies between two major physiographical provinces: the Edwards Plateau and the Black Prairie Region.

The western and central parts of this area represent the eastern boundary of the Edwards Plateau and are covered largely by the Edwards formation. This part has a rather rugged topography due to the resistant limestones which are cut by a number of streams. The Black Prairie Region is represented in the eastern portion and is characterized by a very regular topography due to the presence of the Eagle Ford and Austin formations which erode evenly. The entire northern part has a regular topography for it includes the flood plain of Colorado River. In the entire region the maximum relief is only 300 feet, with a minimum elevation above sea level of approximately 430 feet in Colorado River bed just under the railroad bridge and a maximum elevation of 730 feet on a hill in the central portion.

GEOLOGY

Although there is little relief in this area, each formation from the Glen Rose through the Austin, except the Walnut and Comanche Peak, outcrops at the surface. This is entirely due to the complicated fault system which was developed incident to the formation of the Balcones escarpment. The main fault, which is between the Glen Rose and Edwards formations, has a direction of N 55 E and runs along the western end of this area. West of the fault the Glen Rose formation outcrops over an area of many square miles. East of the main fault is the

area which is characterized by numerous minor faults. These faults usually run almost parallel to the main fault and their throw varies from a few inches to about 50 feet. This system of faulting includes the Edwards and all of the younger formations of Comanche Series except the Walnut and Comanche Peak. In the northern part, along the Colorado, alluvial deposits of silt, sand, and gravel are found. These deposits were built up during the Pleistocene and Recent.

Table of Cretaceous Formations Exposed in Central Texas.

Cretaceous	Gulf		Navarro
			Taylor
			Austin
			Eagle Ford
	Comanche	Washita	Buda
			Del Rio
			Georgetown
		Fredericksburg	Edwards
			Comanche Peak
			Walnut
		Trinity	Glen Rose
			Travis Peak

Of these formations, all except the Travis Peak, Walnut, Taylor, and Navarro are exposed in the area mapped.

GLEN ROSE

The Glen Rose formation is composed of alternating beds of marl and limestone. Some of the marls have a caliche-like appearance and contain few fossils while others are much purer limestone and contain many fossils. The limestones vary from soft chalky beds of a few inches in thickness to very hard arenaceous or crystalline beds which are often massive.

Some of the characteristic fossils are listed below.

Ampulina sp.

Arctica mediale Conrad

Arctica roemeri Cragin

Arctica texana Conrad

Cucullaea gracilis Cragin

Enallaster obliquatus Clark

Hemiaster comanchei Clark

Homomya solida Cragin

Lunatia sp. Hill

Nerinea pedernale Whitney, Thesis Ms.

Nerinea roemeri Whitney, Thesis Ms.

Orbitolina texana (Roemer)

Orbitolina whitneyi Carsey

Ostrea alternans Cragin

Pholadomya knowltoni Hill

Porocystis globularis (Giebel)

Salenia texana Credner

Tylostoma sp.

WALNUT

The Walnut does not occur in the area mapped but the writer has studied the formation near Austin with Dr. F. L. Whitney and Mr. S. W. Horne, who have recently made a detailed study of the formation.

Prior to this recent work, the Walnut at Austin was described by Hill[1] as having a thickness of 10 to 50 feet, but Horne[2] measured a section on the Rob Roy ranch, which has a thickness of 77 feet.

The formation is composed of beds of clay and limestone. The clays are very fossiliferous and are easily recognized because of the yellow color produced by oxidation. The limestones vary from a few inches in thickness to very massive beds which contain many fossils.

A list of the more common fossils is given below.

Algae imprints

Anchura sp.

Cyprimeria texana Roemer

Diplopodia texana (Roemer)

Enallaster texanus (Roemer)

Metengonoceras enscriptum Hyatt

Exogyra texana Roemer

---

[1] Hill, R. T.: "The Comanche Series of the Texas-Arkansas Region," Bull. Geol. Soc. Amer., Vol. 2, p. 512, 1891.

[2] Horne, S. W.: The Stratigraphy of the Walnut Formation in Lampasas, Williamson, Travis, Hays, and Comal Counties, Texas, Thesis Manuscript, The University of Texas, 1930.

Gryphaea marcoui Hill and Vaughan

Hemiaster whitei Clark

Holectypus planatus Roemer

Modiola concentrico-costellata Roemer

Orbitolina walnutensis Carsey

Plicatula sp.

Protocardia texana Conrad

Pseudodiadema texanum (Roemer)

Tylostoma pedernalis (Roemer)

COMANCHE PEAK

This formation, which is the middle member of the Fredericksburg division, is very difficult to differentiate from the underlying Walnut formation. It was originally described by Hill[3] as being 100 feet in thickness, but a recent study by Horne[4] revealed that much of the so-called Comanche Peak is really the upper part of the Walnut.

At present this formation comprises about 15 feet of white chalky limestone which lies between the Walnut and Edwards formations. Since the original division of the Fredericksburg was based on lithology, it is likely that a new classification based on paleontology will change the

---

[3] Hill, R. T.: "The Comanche Series of the Texas-Arkansas Region," Bull. Geol. Soc. Amer., Vol 2, p. 512, 1891.

[4] Horne, S. W.: The Stratigraphy of the Walnut Formation in Lampasas, Williamson, Travis, Hays, and Comal Counties, Texas, Thesis Manuscript, The University of Texas, 1930.

nomenclature to include the Comanche Peak, the Walnut, and the Edwards as facies or zones of a single formation.

The fossils of the Comanche Peak are almost like those of the Walnut so no separate list will be given.

EDWARDS

This formation is composed chiefly of very pure, hard, massive limestone beds. In addition to the massive beds, many thinner beds of softer materials are found. These vary from soft marly clay beds to hard nodular limestones which are highly fractured. The clay beds are very difficult to distinguish from the clays of the Walnut for the faunas of the two formations are very similar in the Austin Section.

Probably the most interesting feature of the Edwards is the wide occurence of flint concretions which seem to be indigenous to the formation. The concretions occur in definite horizons which can easily be traced along an exposure. They vary in color from almost white to dark brown and Taff[5] found this variation in color to be zonal.

The Edwards also has a very interesting mode of weathering which develops a "honey-comb" structure. This weathering is due to the presence of underground water in limestone which varies in hardness and solubility.

Upon weathering, the Edwards leaves a fairly good brownish

---

[5] Taff, J. A.: "Cretaceous Area North of the Colorado River," Geological Survey of Texas, Third Annual Report, 1891.

black soil which is fertile, but rather shallow. This shallowness is probably due to the slow rate of weathering of the bed rock and to the rapid rate of erosion of the softer soil.

No complete section of the Edwards has been obtained in Travis County. Eifler[6] measured a section combining three different exposures which totaled 234' 3". He thinks that the total thickness is about 300', but of course the missing part can only be estimated. The characteristic fossils of the Edwards are given below.

Caprina crassifibra Roemer
Cerithium obliterato-granosum Roemer
Chrondrodonta munsoni (Hill)
Cladophyllia furcifera Roemer
Eoradiolites davidsoni (Hill)
Goniopygus zitteli Clark
Lucina acutelineolata Clark
Monopleura pinguiscula White
Neithea duplicosta (Roemer)
Toucasia patagiata (White)
Toucasia texana (Roemer)

GEORGETOWN

The Georgetown, which lies unconformably upon the Edwards, has a very limited extent in this area and it was impossible to

---

[6] Eifler, G. K.: The Edwards Formation in the Balcones Fault Zone, Thesis Manuscript, The University of Texas, p. 34, 1930.

obtain a complete section.

Cuyler[7] gives the following description of the Georgetown at Austin:

> "The Georgetown formation consists largely of alternating beds of hard, impure, white limestones and beds of marls or marly clays. Before exposure and weathering, the limestone is hard and has a blue color, but after weathering it is yellowish-white, some parts becoming nodular."

The section given by Hill[8] at Austin is as follows:

"Georgetown formation:	Feet
Massive brownish limestone studded with *Kingena wacoensis* (Terebratula bed)	2
Softer lime material (hard marl)	8.6
Grayish limestone, irregular fracture, with *Alectryonia carinata* and *Gryphaea washitaensis*	1
Yellow or reddish calcareous shale	4.3
Alternating layers of hard and soft limestone with *Alectryonia carinata* G. *washitaensis*, *Exogyra americana*, *Lima wacoensis*, *Schloenbachia leonensis*, *Epiaster elegans*	18
Hard, grayish limestone	33
Soft, chalky limestone with a saline taste and with fucoid layers at the base	13
Edwards limestone	
	79.9"

Among the characteristic fossils of the Georgetown are:

Alectryonia carinata (Lamarck)

---

[7] Cuyler, R. H.: "The Georgetown Formation of Central Texas and its North Texas Equivalents," Bull. A.A.P.G., Vol. 13, No. 10, p. 1292, 1929.

[8] Hill, R. T.: "Geography and Geology of the Black and Grand Prairies, Texas," U. S. Geol. Surv., Twenty-first Annual Report, Part 7, p. 265, 1901.

Desmoceras brazoense (Shumard)

Exogyra americana Marcou

Gryphaea corrugata (Say)

Gryphaea navia Hall

Hamites fremonti Marcou

Holectypus charltoni Cragin

Kingena wacoensis (Roemer)

Macraster elegans (Shumard)

Neithea georgetownensis Kniker

Ostrea quadriplicata Shumard

Oxytropidoceras acuticarinatum (Shumard)

Pervinquieria leonensis (Conrad)

Pervinquieria trinodosa (Boese)

Turrilites brazoensis Roemer

DEL RIO

The Del Rio is very well exposed in the western part of the area mapped. It is composed of soft clays which are seldom exposed unless a cap of Buda limestone is present. These fine-grained, laminated clays contain an abundance of Exogyra arietina Roemer which are perfectly preserved and are often coated with a thin layer of iron oxide. Much selenite is also present in the formation.

The following section was taken 4.3 miles from Austin on the Austin-Burnet road:

Buda formation	Feet
Del Rio Formation:	
Clay containing Exogyra arietina	32.5
Hard, arenaceous flags	.5
Clay bed containing many Exogyra arietina ...	47.
Georgetown formation	
	80.0

BUDA

The Buda, which lies conformably upon the Del Rio formation is composed of limestones which may be divided into distinct members.

The lower member is composed of a light colored, chalky limestone which is thinly bedded and nodular. The upper beds present a mottled brown appearance and are much more massive and crystalline than the lower beds. The thickness of the Buda at Austin is 42 feet.[9] Following is a list of the more characteristic fossils of the Buda:

Barbatia simondsi Whitney

Budiceras mexicanum Boese

Fistulana ruperti Whitney

---

[9] Whitney, F. L.: Conversation with the writer, March, 1931.

Graptocarcinus texanus Roemer

Harpagodes shumardi (Hill)

Hemiaster calvini (Clark)

Homomya budaensis Whitney

Neithea roemeri (Hill)

Nerinea volana Cragin

Pleurotomaria stantoni Shuttuck

Turritella budaensis Shattuck

Tylostoma hilli Whitney

EAGLE FORD

A very good exposure of this formation is found one-half mile south of the I. & G. N. railroad bridge. This locality is on Bouldin Creek and is immediately east of the area under consideration. The section as measured by Durham[10] is as follows:

"Austin Chalk:

Cgl. limestone, phosphate nodules, green sands, rolled Eagle Ford fossils	2' 0"

Eagle Ford:

3. Bluish gray splintery shale, very

---

[10] Durham, C. A.: The Stratigraphy of the Eagle Ford Formation from the Red River Southward to Austin, Thesis Manuscript, The University of Texas, p. 13, 1931.

	thin liminae, Layers of pyrite or marcasite nodules in upper part about seven feet below the base of the Austin	21'	6"
2.	Flagstones -- thin calcareous limestones alternating with layers of gray shale. Bentonite layers (seven in number), largest about six inches, smallest about one-fourth inch. Flags on weathering have brownish color, but on fresh exposure are blue black. Become increasingly more argillaceous near the upper third of this formation. Fish remains, phosphate nodules, fossil ice crystals imprint	8'	4"
1.	Bluish black fissile shale containing hard sandy calcareous concretions, sponge spicules	11'	8"
		41'	5"

Buda:

Uneven surface of reddish brown porous limestone containing Arctica sp., Neithea roemeri, Pachymya sp."

The Eagle Ford rests unconformably upon the Buda formation, the Woodbine being regarded as entirely missing. Another erosional interval came at the close of the Eagle Ford deposition causing an unconformity with the overlying Austin formation.

Characteristic fossils are given below:

Acanthoceras aff. cunningtoni (Sharpe)

Metoicoceras whitei Hyatt

Ostrea lugubris Conrad

AUSTIN

The Austin, which lies unconformably upon the Eagle Ford, is rather uniformly represented by a white, chalky limestone which breaks with a conchoidal fracture. Some of these beds of marl and impure chalk alternate with the more massive beds. The value of the Austin as a building stone is greatly lessened by the small nodules of marcasite which oxidize and cause iron stains.

The Austin occurs in the extreme eastern part of the area mapped but there is no exposure where a section could be measured. At Manor, the Austin formation is about 410 feet in thickness according to Hill.[11]

Weathering produces a very rich, black soil and upon this formation are many large liveoak trees which enable one to recognize the Austin from quite a distance.

Characteristic fossils of the Austin are:

Durania austinensis (Roemer)

Exogyra laeviuscula Roemer

Gryphaea aucella Roemer

Hemiaster texanus Roemer

---

[11] Hill, R. T.: "Geography and Geology of the Black and Grand Prairies, Texas," U. S. Geol. Surv., Twenty-first Annual Report, Part 7, 1901.

Inoceramus cripsii Roemer

Mortoniceras texanum (Roemer)

Spondylus guadalupae Roemer

Terebratula guadalupae Roemer

PLEISTOCENE

The materials of Pleistocene age which occur in this area consist of silt, sand, and gravel which are arranged in a homogeneous manner. They have been deposited as terraces of the Colorado and are found also along Barton Creek.

CONCLUSIONS

After mapping the area in detail, the new map is found to differ from the geologic map, published in Geologic Folio No. 76 of the United States Geological Survey, in a number of places; especially in the faulting. Each fault and normal contact was traced and mapped as accurately as possible. The variation is probably due to the fact that much of the vegetation has been removed and many excavations for roads and buildings have uncovered a number of exposures which make a much closer survey possible.

BIBLIOGRAPHY

Cuyler, R. H.: "The Georgetown Formation of Central Texas and its North Texas Equivalents," Bull. A.A.P.G.,Vol. 13, No. 10, 1929.

Duessen, Alexander: "Geology of the Coastal Plain West of the Brazos River," U. S. Geol. Surv., Professional Paper 126, 1924.

Eifler, G. K.: The Edwards Formation in the Balcones Fault Zone, Thesis Manuscript, The University of Texas, 1930.

Hill, R. T.: "Geography and Geology of the Black and Grand Prairies, Texas," U. S. Geol. Surv., Twenty-first Annual Report, Part 7, 1901.

Hill, R. T.: "The Comanche Series of the Texas-Arkansas Region," Bull. Geol. Soc. Amer., Vol. 2, 1891.

Hill, R. T., Vaughan, T. W.: "Austin Folio," U. S. Geol. Surv., Geological Atlas No. 76, 1902.

Hill, R. T. and Vaughan, T. W.: "Geology of the Edwards Plateau and the Rio Grande Plain Adjacent to Austin and San Antonio, Texas," U. S. Geol. Surv., Eighteenth Annual Report, Part 2, 1897.

Horne, S. W.: The Stratigraphy of the Walnut Formation in Lampasas, Williamson, Travis, Hays, and Comal Counties, Texas, Thesis Manuscript, The University of Texas, 1930.

Taff, J. A.: "Cretaceous Area North of the Colorado River," Geological Survey of Texas, Third Annual Report, 1891.

Taff, J. A.: "Cretaceous Area North of the Colorado River," Geological Survey of Texas, Fourth Annual Report, 1892.

Udden, J. A.; Baker, C.L., and Boese, Emil: "Review of the Geology of Texas," University of Texas Bulletin, No.44, 1919.

Whitney, F. L.: "Bibliography and Index of North America Mesozoic Invertebrata," Bulletins of American Paleontology, Vol. 12, No. 48.

Whitney, F. L.: "Fauna of the Buda Limestone," University of Texas Bulletin, No. 184, 1911.

N

S

1 3/4 1/2 1/4 0 1 2

SCALE IN MILES.